CLAIMS

1. Retroviral particle comprising a protein derived from the Gag polyprotein, an envelope protein, optionally an integrase and at least two encapsidated non-viral RNAs, the encapsidated non-viral RNAs each comprising an RNA sequence of interest bound to an encapsidation sequence, each encapsidation sequence being recognized by a binding domain introduced into the protein derived from the Gag polyprotein and/or into the integrase, and at least one of said sequences of interest of the encapsidated non-viral RNAs comprises a part coding at least one molecular structure specifically recognizing an epitope, and the molecular structure is a TCR (T cell receptor) or CAR (chimeric receptor) type immune receptor.
2. The retroviral particle according to claim 1, comprising a nucleocapsid protein, an envelope protein, optionally an integrase and at least two encapsidated non-viral RNAs, the encapsidated non-viral RNAs each comprising an RNA sequence of interest bound to an encapsidation sequence, each encapsidation sequence being recognized by a binding domain introduced into the nucleocapsid protein and/or into the integrase.
3. The retroviral particle according to claim 2, wherein the sequences of interest of the at least two encapsidated non-viral RNAs are identical.
4. The retroviral particle according to claim 2, wherein the at least two encapsidated non-viral RNAs differ in their RNA sequence.
5. The retroviral particle according to claim 4, wherein the sequence of interest of the other encapsidated non-viral RNA codes an immunomodulating protein.
6. The retroviral particle according to any one of claims 3 to 5, further comprising a third encapsidated non-viral RNA.
7. The retroviral particle according to any one of claims 1 to 6, wherein the at least one molecular structure specifically recognizing an epitope is immunogenic.
8. The retroviral particle according to any one of claims 2 to 7, wherein the binding domain is introduced into the nucleocapsid protein, and a second binding domain may be introduced into the nucleocapsid and/or into the integrase.
9. The retroviral particle according to any one of claims 1 to 7, wherein the binding domain is introduced into the integrase, and a second binding domain may be introduced into the nucleocapsid and/or into the integrase.
10. The retroviral particle according to any one of claims 2 to 9, which is a lentiviral particle.

11. The lentiviral particle according to claim 10, wherein:
    - the binding domain is the "Coat" protein sequence of the MS2 bacteriophage,
    - the encapsidation sequence of the non-viral RNAs is a stem-loop sequence of MS2,
    - the nucleocapsid protein is the nucleocapsid protein (NC) of HIV belonging to the Gag polyprotein, said NC being mutated at the second zinc finger in order to insert the "Coat" protein sequence of the MS2 bacteriophage.

12. Lentiviral particle according to claim 10, wherein:
    - the binding domain is the "Coat" protein sequence of the PP7 phage,
    - the encapsidation sequence of the non-viral RNAs is a PP7 stem-loop sequence,
    - the nucleocapsid protein is the nucleocapsid protein (NC) of HIV belonging to the Gag polyprotein, said NC being mutated at the second zinc finger in order to insert the "Coat" protein sequence of the PP7 bacteriophage.

13. Composition comprising particles according to any one of claims 1 to 12.

14. A kit for producing particles according to any one of claims 1 to 12, comprising:
    (i) an expression plasmid comprising at least one sequence of interest, for which an encapsidation sequence is inserted upstream or downstream of said sequence,
    (ii) an encapsidation plasmid coding a protein originating from the Gag polyprotein and/or a chimeric integrase, comprising a binding domain enabling an encapsidation sequence to be recognized, and,
    (iii) an envelope plasmid coding an envelope protein.

15. The production kit according to claim 14, further comprising a second encapsidation plasmid coding:
    - a protein derived from the wild-type Gag polyprotein, when the first encapsidation plasmid codes a protein derived from the chimeric Gag polyprotein, and/or
    - a wild-type integrase, when the first encapsidation plasmid codes a chimeric integrase.

16. A method for manufacturing a kit according to claim 14, comprising:
    (i) preparing an expression plasmid comprising at least one sequence of interest, for which an encapsidation sequence is inserted upstream or downstream of said sequence
    (ii) preparing an encapsidation plasmid coding a protein derived from the Gag

polyprotein and/or a chimeric integrase comprising a binding domain enabling an encapsidation sequence to be recognized, and

(iii) preparing an envelope plasmid coding an envelope protein.

17. Method for manufacturing the particles according to any one of claims 1 to 12, comprising a step of co-transfecting cells with:

(i) an expression plasmid comprising at least one sequence of interest, for which an encapsidation sequence is inserted upstream or downstream of this sequence,

(ii) an encapsidation plasmid coding a protein derived from the Gag polyprotein and/or a chimeric integrase comprising a binding domain enabling an encapsidation sequence to be recognized, and

(iii) an envelope plasmid coding an envelope protein.

and a step of harvesting the supernatant of the transfected cells comprising the particles.

18. Method for manufacturing the particles according to any one of claims 4 to 12, comprising a step of co-transfecting cells with:

(i) an expression plasmid comprising at least two different non-viral RNA sequences, each RNA sequence comprising a sequence of interest for which an encapsidation sequence is inserted upstream or downstream of said sequence of interest, or alternatively a first and a second expression plasmid each comprising a sequence of interest, upstream or downstream of which an encapsidation sequence is inserted,

(ii) an encapsidation plasmid coding a chimeric nucleocapsid protein comprising a binding domain making it possible to recognize the encapsidation sequence, and,

(iii) an envelope plasmid coding an envelope protein,

and a step of harvesting the supernatant of the transfected cells comprising the particles.

19. Method of manufacture according to claim 17 or 18, wherein the supernatant is clarified, and then optionally concentrated and/or purified.

20. Method of manufacture according to any one of claim 17 to 19, wherein the co-transfecting step is additionally carried out with a second encapsidation plasmid coding:

- a protein derived from the wild-type Gag polyprotein, when the first encapsidation plasmid codes a protein derived from the chimeric Gag

polyprotein, and/or

- a wild-type integrase, when the first encapsidation plasmid codes a chimeric integrase.

21. Use of the particles according to any one of claims 1 to 12, or the composition according to claim 13 for transducing cells of the immune system.